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(54) OPTICAL RECORDING MEDIUM AND ITS MANUFACTURING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To improve the property by expanding the recording area, increasing the storage capacity, and suppressing reduction of a dielectrics film thickness near the mask edge and reduction of the reflection factor while avoiding corrosion when forming a plurality of dielectric films on a base plate.

SOLUTION: The upper dielectric films 6 are formed after forming a reflection film 3, a lower dielectric film 4, and a recording film 5 sequentially on one main surface 2a of a disk plate 2. Two vacuum chambers are used to form the upper dielectric films 6. First, the 1st upper dielectric film 6a is formed in the 1st vacuum chamber, by carrying out masking using an inner mask and an outer mask. After removing the outer mask, the 2nd upper dielectric film 6b is formed in the 2nd vacuum chamber. Then, sticking a light transmissive protection layer 9 through an adhesive layer 8, an optical disk 1 is manufactured.

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CLAIMS

[Claim(s)]

[Claim 1] The reflective film constituted possible [reflection of the above-mentioned laser beam] at least on the 1 principal plane of a disk substrate, In the optical record medium with which the laminating of the lower layer dielectric film which consists of dielectric materials, the record film constituted possible [record of the above-mentioned information signal], and the upper dielectric film which consists of dielectric materials was carried out one by one, and it was constituted The optical record medium which the above-mentioned upper dielectric film consists of two-layer dielectric films at least, and is characterized by preparing it as the dielectric film of the outermost layer of the above-mentioned upper dielectric films covers the formation field of the above-mentioned dielectric films other than the outermost layer at least.

[Claim 2] The optical record medium according to claim 1 with which the above-mentioned upper dielectric film is characterized by consisting of two-layer dielectric films with which the laminating of the 1st dielectric film and 2nd dielectric film was carried out one by one.

[Claim 3] The optical record medium according to claim 2 characterized by the 1st dielectric film of the above and the 2nd dielectric film of each other of the above consisting of ingredients of the same kind.

[Claim 4] The optical record medium according to claim 3 with which the above-mentioned ingredient is characterized by being the mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 5] The optical record medium according to claim 2 characterized by consisting of ingredients with which the 1st dielectric film of the above differs from the 2nd dielectric film of the above mutually.

[Claim 6] The optical record medium according to claim 5 with which the above-mentioned ingredient is characterized by being the mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 7] the above -- the optical record medium according to claim 1 characterized by all two-layer dielectric films consisting of the same ingredient even if few.

[Claim 8] The optical record medium according to claim 1 characterized by the dielectric film of the above-mentioned outermost layer consisting of a mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 9] The optical record medium according to claim 1 with which thickness of the dielectric film of the above-mentioned maximum upper layer is characterized by 5nm or more being 70nm or less.

[Claim 10] The optical record medium according to claim 1 with which thickness of the dielectric film of the above-mentioned maximum upper layer is characterized by 5nm or more being 50nm or less.

[Claim 11] The optical record medium according to claim 1 with which thickness of the dielectric film of the above-mentioned maximum upper layer is characterized by 5nm or more being 30nm or less.

[Claim 12] The optical record medium according to claim 1 with which the above-mentioned upper dielectric film has a flat-surface circular ring configuration, and the periphery of the dielectric film of the above-mentioned maximum upper layer in the above-mentioned upper dielectric film is characterized by being constituted so that it may become larger than the periphery of dielectric films other than the maximum upper layer while the above-mentioned disk substrate has a flat-surface circular ring configuration.

[Claim 13] The optical record medium according to claim 1 characterized by being constituted possible [record of the above-mentioned information signal] by change in at least two conditions that the above-mentioned record film changes reversibly.

[Claim 14] The optical record medium according to claim 1 characterized by the above-mentioned record film consisting of a phase change ingredient constituted by the phase change of a crystal phase and an amorphous phase possible [record of the above-mentioned information signal].

[Claim 15] The optical record medium according to claim 1 with which wavelength of the above-mentioned laser beam is characterized by 390nm or more being 410nm or less.

[Claim 16] The optical record medium according to claim 1 with which numerical aperture of the objective lens used for record of the above-mentioned information signal is characterized by or more 0.60 being 0.85 or less.

[Claim 17] The optical record medium according to claim 1 characterized overly by the objective lens used in the case of record/playback of the above-mentioned information signal being a hemispherical lens or a solid emersion lens.

[Claim 18] The reflective film constituted possible [reflection of the above-mentioned laser beam] at least on the 1 principal plane of a disk substrate, The lower layer dielectric film which consists of dielectric materials, the record film constituted possible [record of the above-mentioned information signal], And the laminating of the upper dielectric film which consists of dielectric materials is carried out one by one, and it is constituted. The above-mentioned upper dielectric film is the manufacture approach of the optical record medium which consisted of two-layer dielectric films at least. The manufacture approach of the optical record medium characterized by removing the periphery mask of the above-mentioned disk substrate, and forming the dielectric film of the maximum upper layer at least after forming the dielectric film of at least one layer of the above-mentioned upper dielectric films.

[Claim 19] The manufacture approach of an optical record medium according to claim 18 that the above-mentioned upper dielectric film is characterized by consisting of two-layer dielectric films with which the laminating of the 1st dielectric film and 2nd dielectric film was carried out one by one.

[Claim 20] The manufacture approach of the optical record medium according to claim 19 characterized by the 1st dielectric film of the above and the 2nd dielectric film of each other of the above consisting of ingredients of the same kind.

[Claim 21] The manufacture approach of an optical record medium according to claim 20 that the above-mentioned ingredient is characterized by being the mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 22] The manufacture approach of the optical record medium according to claim 19 characterized by consisting of ingredients with which the 1st dielectric film of the above differs from the 2nd dielectric film of the above mutually.

[Claim 23] The manufacture approach of an optical record medium according to claim 22 that the above-mentioned ingredient is characterized by being the mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 24] The manufacture approach of the optical record medium according to claim 18 characterized by the dielectric film of the above-mentioned outermost layer consisting of a mixture of silicon nitride, or zinc sulfide and silicon oxide.

[Claim 25] the above -- the manufacture approach of the optical record medium according to claim 18 characterized by all two-layer dielectric films consisting of the same ingredient even if few.

[Claim 26] The manufacture approach of the optical record medium according to claim 18 characterized by forming the dielectric film of the above-mentioned maximum upper layer in 5nm or more thickness 70nm or less.

[Claim 27] The manufacture approach of the optical record medium according to claim 18 characterized by forming the dielectric film of the above-mentioned maximum upper layer in 5nm or more thickness 50nm or less.

[Claim 28] The manufacture approach of the optical record medium according to claim 18 characterized by forming the dielectric film of the above-mentioned maximum upper layer in 5nm or more thickness 30nm or less.

[Claim 29] The manufacture approach of an optical record medium according to claim 18 that wavelength of the above-mentioned laser beam is characterized by 390nm or more being 410nm or less.

[Claim 30] The manufacture approach of the optical record medium according to claim 18 characterized by being constituted possible [record of the above-mentioned information signal] by change in at least two conditions that the above-mentioned record film changes reversibly.

[Claim 31] The manufacture approach of the optical record medium according to claim 18 characterized by forming the above-mentioned record film from the phase change ingredient constituted by the phase change of a crystal phase and an amorphous phase possible [record of the above-mentioned information signal].

[Claim 32] The manufacture approach of an optical record medium according to claim 18 that numerical aperture of the objective lens used for record of the above-mentioned information signal is characterized by or more 0.60 being 0.85 or less.

[Claim 33] The manufacture approach of the optical record medium according to claim 18 characterized overly by the objective lens used in the case of record/playback of the above-mentioned information signal being a hemispherical lens or a solid emersion lens.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is applied to the optical record medium with which the dielectric film with which the laminating of two or more film was carried out one by one, and it was constituted especially was prepared about an optical record medium and its manufacture approach, and is suitable.

[0002]

[Description of the Prior Art] Conventionally, the so-called DVD-RW (Digital Versatile Disc-ReWritable) is marketed as a real example of the rewritable optical disk using a phase change record ingredient. This DVD-RW sticks the disk-like optical recording medium (the following, optical disk) of the phase change mold of two sheets. The optical disk 101 in front of this lamination is shown in drawing 8 .

[0003] As shown in drawing 8 , it sets to the optical disk 101 in front of this lamination. It reaches for reflecting the 1st dielectric film 103 which consists of a dielectric, the phase change record film 104 with which an information signal is recorded using the phase change of a crystal phase and an amorphous phase, the 2nd dielectric film 105, and a laser beam on 1 principal-plane 102a of the disk substrate 202 which consists of a PC reflective film 106. The laminating of the protective layer 107 for protecting the cascade screen of the reflective film 106 from these 1st dielectric film 103 is carried out one by one, and it is prepared.

[0004] And as shown in drawing 9 A, DVD-RW of a double-sided record configuration can be obtained by preparing two optical disks 101 constituted as mentioned above, and sticking protective layer 107 by the side of those 1 principal-plane 102a through a glue line 108. Moreover, when making only one side into a recording surface, as shown in drawing 9 B, DVD-RW of an one side record configuration can be obtained by sticking those protective layer 107 side for the dummy disk with which the laminating of the reflective film 109 and the protective layer 107 was carried out one by one, and they were constituted on 1 principal-plane 102a of the disk substrate 202, and the optical disk shown in drawing 8 through a glue line 108.

[0005] The laser beam used at the time of the record/playback to such DVD-RW101 is irradiated towards phase change record film 104 from the disk substrate 202 side. And in this DVD-RW101, wavelength of 0.74 micrometers and a laser beam is realized for 0.267micrometers [bit] /and a track pitch (Tp), and 11Mbps(es) and storage capacity of 4.7GB are realized [linear velocity / 3.49 m/s and record bit length] for about 650 micrometers and a data transfer rate.

[0006] And in order to realize large-capacity-izing and the formation of a high transfer rate exceeding this DVD-RW101, the approach whose record linear velocity makes small spot size (diameter of a spot) in the laser beam for record, and improves is effective. In order to make small spot size in the laser beam for record here, specifically, the approach of short-wavelength-izing a laser beam, the approach of enlarging numerical aperture (NA) of an objective lens, etc. can be mentioned.

[0007] If short-wavelength-izing of a laser beam and high NA-ization of an objective lens are especially used together, compared with the case where each of these approach is adopted independently, spot size can be made smaller. For example, if NA of an objective lens uses the objective lens of 0.85 further, using the so-called purple-blue color laser near 400nm as the light source, the further high density record of wavelength lambda will be attained theoretically.

[0008] Thus, in order to raise recording density, it becomes indispensable to aim at improvement in NA/lambda. In this case, in order to attain 8GB as storage capacity, it is necessary to make NA or more into 0.70 at least, and to make wavelength lambda of a laser beam below into 0.68 micrometers (680nm) further.

[0009] And if it takes into consideration that the ************ red laser for the present condition to the blue laser with which spread will be expected in the future corresponds, as for a light transmission layer, it is optimal to set it as 10-177 micrometers. That is, generally the thickness t of the light source wavelength lambda of the disk skew margin theta and the optical pickup for record playback, a numerical aperture (NA), and the light transmission protective layer of a disk is in a correlation. And the relation between these parameters and the disk skew margin theta is practically shown in JP,3-225650,A (reference 1) on the basis of the compact disk (CD) with which the player kinky thread tee is fully proved.

[0010] That is, according to the reference 1, it is necessary to make it -84.115 (lambda/NA 3/t)<=theta<=84.115 (lambda/NA 3/t). If the concrete threshold value of the disk skew margin theta in the case of actually mass-producing a disk is considered here, considering as 0.4 degrees is appropriate. This is because the manufacture yield will fall and cost will increase, if it is made smaller than this when mass production is considered. The threshold value of the disk skew margin theta is [in / record medium / existing / optical / CD] 0.4 degrees in 0.6 degrees and DVD.

[0011] Then, when it calculates as how much the thickness of a light transmission protective layer should be set by short-wavelength-izing of laser, and high NA-ization as theta= 0.4 degrees and the wavelength lambda of a laser beam is lambda= 0.65 micrometers (red laser), as for NA, 0.78 or more are required. Moreover, when short wavelength-ization of a laser beam progresses and wavelength lambda fixes NA or more [above-mentioned] to 0.78 using the semiconductor laser which is about 0.4 micrometers, it is necessary to make thickness t of the light transmission protective layer of a disk small to 177 micrometers or less. On the other hand, the minimum of the thickness of this light transmission protective layer is determined by the protection feature of the light transmission protective layer which protects the optical recording film. Furthermore, when the effect of dependability, the collision of 2 group lens, etc. is taken into consideration, as thickness of a light transmission protective layer, 10 micrometers or more are desirable.

[0012] Here, a light transmission protective layer explains an optical record medium (optical disk) which was thin-film-ized and which was mentioned above. This optical disk 201 is shown in drawing 10 .

[0013] As shown in drawing 10 , the optical disk 201 with which the light transmission protective layer was thin-film-ized has the configuration to which the laminating of the light transmission protective layer 209 was carried out through the glue line 208 on the disk substrate 202 on the information signal layer 207 which consists of the reflective film 203, the 1st lower layer dielectric film 204, record film 205, and the 2nd upper dielectric film 206, and this information signal layer 207. Among these, when the disk substrate 202 constitutes this from a veneer, a certain amount of rigidity is required. Therefore, the thickness of the disk substrate 202 is about 0.6mm.

[0014] By the way, in optical record media which were mentioned above, such as DVD-R W101 and an optical disk 201, polycarbonate resin and polyolefine system resin which are used as a support substrate having thermal resistance at the time of melting molding, it is easy to fabricate and has the advantage that there is little deterioration and the mechanical property is also further excellent. Therefore, it is an ingredient useful as a support substrate of an optical record medium.

[0015] Moreover, in what sticks the disk of two sheets and is constituted, the point that a light transmission protective layer is formed of lamination after forming the thin film for record on a support substrate is important. As for the optical disk which sticks such a disk of two sheets and is constituted, the dependability of the yield or an optical record medium is influenced by this lamination in many cases.

[0016] Moreover, in the optical disk constituted so that record/playback of an information signal might be performed by irradiating the side in which the information signal layer was prepared to a disk substrate like an optical disk 201 to a laser beam, when the laser beam whose wavelength is about 400nm is used, as thickness of the upper dielectric film 206, about 140nm is needed. therefore, since it suits, in order to serve, and to raise the tact time at the time of manufacture with the membrane formation time amount of film other than upper dielectric film 206 in the information signal layer 207 of an optical disk 201, two chambers or three chambers are used for this upper dielectric film 206, and it is formed.

[0017] That is, concretely, when forming the upper dielectric film 206 using two chambers, as shown in drawing 11 , on 1 principal-plane 202a of the disk substrate 202, the 1st sputtering chamber is used and the reflective film 203 is formed first. Then, the lower layer dielectric film 204 is formed using the 2nd sputtering chamber, and record film 205 is formed using the 3rd sputtering chamber. And 1st upper dielectric film 206a is formed using the 4th sputtering system, and 2nd upper dielectric film 206b is further formed using the 5th sputtering system.

[0018] Moreover, it is the same when using three chambers. That is, first, as shown in drawing 12 , on the disk substrate 202, a sputtering chamber is used, respectively and the sequential reflective film 203, the lower layer dielectric film 204, and record film 205 are formed. Then, the upper dielectric film 206 is formed using a sputtering chamber by carrying out the laminating of 1st upper dielectric film 206a, 2nd upper dielectric film 206b, and the 3rd upper dielectric film 206c one by one, respectively. The information signal layer 207 is formed of this.

[0019] When forming each film on a disk substrate using such a sputtering chamber, it usually masks at the inner circumference section and the periphery section of a disk substrate of a flat-surface circular ring configuration, respectively. That is, while masking the inner circumference section of a disk substrate using an inner circumference mask, the periphery section is masked using a periphery mask.

[0020] This masking is for preventing that the reflective film, record film, etc. are exposed in the inner circumference edge and periphery edge of a disk substrate which have a flat-surface circular ring configuration. If such masking is not performed, the reflective film and record film will be exposed into the manufacture process of an optical disk, it will originate in this, and corrosion will occur on these film.

[0021]

[Problem(s) to be Solved by the Invention] However, when this masking is performed, there is a problem that the value of a request of the thickness of the film formed is not acquired especially [near the inner circumference edge (the mask edge of a periphery mask near / i.e., /) of a periphery mask]. This is because movement of sputtered particles will be interrupted with a periphery mask and deposition of an ingredient will be controlled. It will become impossible thereby, to obtain desired thickness as thickness of the film formed.

[0022] Moreover, compared with the case where the laser beam whose wavelength is about 650nm is used for record/playback of an information signal in the optical disk using the laser beam of the short wavelength whose wavelength is about 400nm, the change on the property will become large to fluctuation of thickness. Therefore, compared with the optical disk which was made to perform record/playback of an information signal using the laser beam whose wavelength is about 650nm, there was a problem of it becoming impossible to use the part near [in an information signal layer] the mask edge as a record section. That is, since the thickness of the upper dielectric film becomes small from desired thickness in the periphery edge of an optical disk, effect arises in a reflection factor. By this, a focus and tracking separate and the problem of it becoming impossible to acquire an information signal arises.

[0023] Moreover, the periphery section of an optical disk has the large die length of the circumferencial direction about about 2.4 times as compared with the inner circumference section. Fluctuation of the magnitude of the width of face which met by this radial [of the field of the circular ring configuration which cannot be used as a record section] in this periphery section has the large effect which contributes to the storage capacity of the whole optical disk as compared with the inner circumference section. Therefore, especially in the periphery section, a thing of an optical disk for which as many fields available as a record section as possible are secured was desired.

[0024] Therefore, by preventing thickness reduction of a dielectric film [/ near the mask edge], controlling generating of the corrosion of the reflective film or record film, in case the purpose of this invention carries out the laminating of the dielectric film which consists of two or more film on a disk substrate While controlling reduction of the reflection factor in this field, expanding a record section and making the storage capacity of an optical record medium increase sharply, it is in offering the optical record medium which can raise properties, such as a recording characteristic, and its manufacture approach.

[0025]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention of the 1st of this invention The reflective film constituted possible [reflection of a laser beam] at least on the 1 principal plane of a disk substrate, In the optical record medium with which the laminating of the lower layer dielectric film which consists of dielectric materials, the record film constituted possible [record of an information signal], and the upper dielectric film which consists of dielectric materials was carried out one by one, and it was constituted The upper dielectric film consists of two-layer dielectric films at least, and it is characterized by preparing it, as the dielectric film of the outermost layer of the upper dielectric films covers the formation field of dielectric films other than the outermost layer at least.

[0026] Invention of the 2nd of this invention on the 1 principal plane of a disk substrate at least The reflective film constituted possible [reflection of a laser beam], the lower layer dielectric film which consists of dielectric materials, The laminating of the record film constituted possible [record of an information signal] and the upper dielectric film which consists of dielectric materials is carried out one by one, and it is constituted. The upper dielectric film is the manufacture approach of the optical record medium which consisted of two-layer dielectric films at least. After forming the dielectric film of at least one layer of the upper dielectric films, the periphery mask of a disk substrate is removed and it is characterized by forming the dielectric film of the maximum upper layer at least.

[0027] In this invention, in order to raise a manufacture baton, typically, the laminating of the 1st dielectric film and 2nd dielectric film is carried out one by one, and the film which consists of two or more layers is constituted. And in this invention, the 1st dielectric film and 2nd dielectric film of each other consist of ingredients of the same kind suitably. Moreover, typically as an ingredient at this time, it is the mixture (ZnS-SiO2) of silicon nitride (SiN), or zinc sulfide and silicon oxide. Moreover, typically in this invention, the cascade screen which consists of the 1st dielectric film and 2nd dielectric film is constituted possible [transparency of a laser beam].

[0028] In this invention, typically, the laminating of the 1st dielectric film, 2nd dielectric film, and 3rd dielectric film is carried out one by one, and the film which consists of two or more layers is constituted. And in this invention, the 1st dielectric film, 2nd dielectric film, and 3rd dielectric film of each other consist of ingredients of the same kind suitably. Moreover, typically as an ingredient at this time, it is the mixture (ZnS-SiO2) of silicon nitride (SiN), or zinc sulfide and silicon oxide. Moreover, typically in this invention, the cascade screen which consists of the 1st dielectric film, 2nd dielectric film, and 3rd dielectric film is constituted possible [transparency of a laser beam].

[0029] In order to prevent that the film becomes island shape in membrane formation in this invention, the thickness of the dielectric film of the maximum upper layer While being 5nm or more and preventing the corrosion of the record film of further a lower layer, or the reflective film typically In order to aim at compaction of a manufacture baton, controlling fluctuation of the reflection factor depending on thickness, typically, 70nm or less 50nm or less needs to be 30nm or less more suitably.

[0030] In this invention, the laminating of the 1st dielectric film and 2nd dielectric film is carried out one by one, they are constituted, and the film which consists of two or more layers consists of ingredients with which this the 1st dielectric film and 2nd dielectric film differ from each other mutually. Moreover, typically, it is the mixture (ZnS-SiO2) of silicon nitride (SiN), or zinc sulfide and silicon oxide as an ingredient at this time.

[0031] Typically in this invention, a membrane formation means to form a dielectric film is single wafer processing. Moreover, in this invention, typically, a membrane formation means to form a dielectric film is a sputtering chamber, and the number of the targets for sputtering installed in a sputtering chamber is one. and in installing one target in a sputtering chamber in this way and forming the film to one disk substrate Typically, while making a disk substrate and the target for sputtering counter mutually It consists of conditions of having arranged so that the medial axis of the disk substrate of a direction perpendicular to one principal plane of a disk substrate and the medial axis of the target for sputtering of a direction perpendicular to the root face of the target for sputtering may lap mutually so that the film may be formed. Moreover, in this invention, it is also possible to use the membrane formation means constituted so that membranes may be formed to two or more disk substrates as a membrane formation means to form a dielectric film at coincidence, and it can use preferably the sputtering chamber corresponding to several many sheets which were made to form membranes to at least two disk substrates using at least one target.

[0032] In this invention, typically, the laminating of a lower layer dielectric film, the record film constituted possible [record of an information signal], the upper dielectric film, and the reflective film constituted possible [reflection of the laser beam used for record/playback of an information signal] is carried out one by one, it is constituted, and the information signal layer is constituted possible

[record of an information signal] and/or refreshable by turning a laser beam to an information signal layer, and irradiating it from a disk substrate side. And the film which consists of two or more of these layers typically for the purpose of making regularity the reflection factor of that membrane formation field is the upper dielectric film by having big effect on the reflection factor in an optical record medium, and maintaining higher surface smoothness.

[0033] In this invention, the laminating of the reflective film with which the information signal layer was constituted typically possible [reflection of the laser beam used for record/playback of an information signal], a lower layer dielectric film, the record film constituted possible [record of an information signal], and the upper dielectric film is carried out one by one, they are constituted, and it is constituted possible [record of an information signal] and/or refreshable by turning a laser beam to an information signal layer, and irradiating it from a disk substrate side. And in this invention, the film which consists of two or more layers is the upper dielectric film suitably. Besides, since a layer dielectric film has big effect on the reflection factor in an optical record medium, it is because it is necessary to make regularity the reflection factor of that membrane formation field by maintaining higher surface smoothness.

[0034] Typically in this invention, the film of two or more layers is a two-layer dielectric film of the 1st dielectric film and the 2nd dielectric film. Moreover, the

1st dielectric film and 2nd dielectric film consist of an ingredient of the same kind mutually suitably. And although this ingredient is the mixture of silicon nitride, or zinc sulfide and silicon oxide, it is also possible to use other ingredients.

[0035] In this invention, the number of the targets for sputtering which a membrane formation means is a sputtering chamber and are suitably installed in this sputtering chamber is one suitably. And in this invention, typically, while making a disk substrate and the target for sputtering counter mutually, it is in the condition arranged so that the medial axis of the disk substrate of a direction perpendicular to one principal plane of a disk substrate and the medial axis of the target for sputtering of a direction perpendicular to the root face of the target for sputtering may lap mutually, and the film is formed.

[0036] In this invention, typically, the laminating of a lower layer dielectric film, the record film constituted possible [record of an information signal], the upper dielectric film, and the reflective film constituted possible [reflection of the laser beam used for record/playback of an information signal] is carried out one by one, it is constituted, and the information signal layer is constituted possible [record of an information signal] and/or refreshable by turning a laser beam to an information signal layer, and irradiating it from a disk substrate side. And the film which consists of two or more of these layers is the upper dielectric film.

[0037] In this invention, when a laminating is carried out one by one and it is constituted, and the reflective film constituted suitably possible [reflection of the laser beam by which an information signal layer is used for record/playback of an information signal], a lower layer dielectric film, the record film constituted possible [record of an information signal], and the upper dielectric film turn a laser beam to an information signal layer and irradiate it from a disk substrate side, it is constituted possible [record of an information signal] and/or refreshable.

[0038] Typically in this invention, the wavelength of the laser beam used for record/playback of an information signal is 400nm or more 650nm or less.

[0039] Typically in this invention, the numerical aperture of the objective lens used in the case of record/playback of an information signal is 0.85 or less [0.60 or more].

[0040] Typically in this invention, the objective lens used in the case of record/playback of an information signal is overly a hemispherical lens or a solid emersion lens.

[0041] In order to secure sufficient corrosion resistance in this invention while controlling the thermal conductivity in a silver alloy easily when it constitutes the reflective film from a silver alloy, typically In order for an additive to be at least one kind of element chosen from the group which consists of calcium (calcium), magnesium (Mg), palladium (Pd), iron (Fe), and copper (Cu) and to secure a good signal property and sufficient corrosion resistance Suitably, the content of an additive is 0.5 or more percentage by weight 3.3 or less percentage by weight.

[0042] In this invention, in an optical flat-surface circular ring-like record medium, while making the thermal conductivity of the inner circumference section increase, in order to make the thermal conductivity of the periphery section low as compared with the inner circumference section, the addition of the additive in the periphery section of the reflective film is made [more] than the addition of the additive in the inner circumference section of the reflective film. And when performing record/playback of an information signal by the constant angular velocity, in order to secure a signal property good, the addition of the additive added by this reflective film is made to increase from the inner circumference section of the reflective film towards the periphery section in accordance with radial [of a disk substrate] suitably.

[0043] In this invention, in order to large-capacity-ize rather than optical record media, such as conventional DVD-RW, typically, the concavo-convex slot truck is formed in one principal plane of a disk substrate, and the track pitch of a slot truck is 0.74 micrometers or less. Moreover, the track pitch of a slot truck is determined by the diameter of a spot of the laser beam irradiated etc., and a track pitch is 0.24 micrometers or more suitably.

[0044] In this invention, in order to enable [that rewriting is possible or] the postscript of an optical record medium, typically, record film is constituted by change of at least two reversible conditions possible [record of an information signal], and record film consists of a phase change ingredient constituted by the phase change (phase transition) of a crystal phase and an amorphous phase possible [record of an information signal] suitably.

[0045] In order to perform record and/or playback of an information signal using an about 650nm laser beam, in this invention specifically On the 1 principal plane of a disk substrate, the information signal layer from which the laminating of a lower layer dielectric film, record film, the upper dielectric film, and the reflective film was carried out one by one and which they consisted of is prepared. With one principal plane of a disk substrate, it is constituted possible [record of an information signal] and/or refreshable to the information signal layer by irradiating a laser beam towards an information signal layer from the other principal planes of the opposite side. Moreover, in order to protect the information signal layer which contributes to record/playback of an information signal, typically, the protective layer is prepared through the glue line on the information signal layer on the 1 principal plane of a disk substrate. Moreover, two things for which the optical record medium of a double-sided record mold is constituted are also possible by sticking those protective layer side through adhesives using the optical record medium constituted in this way. Moreover, it is also possible to constitute the optical record medium of an one side record mold by sticking these using the optical record medium constituted as mentioned above and the dummy disk which does not have an information signal layer for recording/reproducing.

[0046] In order to perform record/playback of an information signal using the optical pickup into which wavelength of a laser beam was short-wavelength-ized more, and the objective lens high numerical aperture (NA) Turned more in this invention, suitably The optical record medium by these 1st and 2nd invention On the 1 principal plane of a disk substrate, the information signal layer from which the laminating of the reflective film, a lower layer dielectric film, record film, and the upper dielectric film was carried out one by one and which they consisted of is prepared. It consists of sides in which an information signal layer exists to a disk substrate possible [record of an information signal] and/or refreshable by irradiating a laser beam towards this information signal layer. Moreover, in case record/playback of an information signal are performed using the optical pickup into which wavelength of a laser beam was short-wavelength-ized more, and the objective lens high numerical aperture (NA) Turned more, in order to protect an information signal layer from an optical head, the light transmission protective layer which can penetrate a laser beam at least is prepared through the glue line on the information signal layer on the 1 principal plane of a disk substrate.

[0047] In this invention, typically the polycarbonate resin used as an ingredient of a light transmission nature sheet A dihydric-phenol system (for example, bisphenol A) Under existence of acid binders (for example, sodium hydroxide (NaOH) etc.), It is what is manufactured by the phosgene method compounded by making it react with a phosgene. Specifically The branching-ized polycarbonate which has a phenolic hydroxyl group as a branching-ized agent besides usual polycarbonate resin, As an end halt agent, end long-chain alkyl polycarbonate resin, such as long-chain alkyl acid chloride or a long-chain alkyl ester interchange phenol, Such mixture etc. is used for the end long-chain alkyl branching polycarbonate resin and the pan using both above-mentioned branching agents and end halt agents. And these polycarbonate resin is fed into extrusion equipment, is fused with heating apparatus, such as a heater, is extruded in the shape of a sheet, and is formed in the shape of a sheet by using two or more cooling rollers.

[0048] Typically in this invention, the record ingredient which constitutes the whole record film or a part consists of an ingredient which produces a reversible change of state by the exposure of a laser beam. The phase change ingredient which produces a reversible phase change (phase transition) between an amorphous state and a crystallized state especially is desirable, and each well-known thing, such as cull GOGEN of a cull GOGEN compound or a simple substance, is usable. Specifically (Tellurium Te) (selenium Se) germanium antimony tellurium (germanium-Sb-Te), germanium-Te, Sb-Te, an indium antimonide tellurium (In-Sb-Te), Silver and an indium antimonide tellurium (Ag-In-Sb-Te), Gold and an indium antimonide tellurium (Au-In-Sb-Te), Germanium antimony tellurium palladium (germanium-Sb-Te-Pd), A germanium antimony tellurium selenium (germanium-Sb-Te-Se), An indium antimonide selenium (In-Sb-Se), a bismuth tellurium (Bi-Te), A bismuth selenium (Bi-Se), Sb-Se, germanium-Sb-Te-Bi, Germanium antimony tellurium cobalt (germanium-Sb-Te-Co), the system containing germanium-Sb-Te-Au, or the system that introduced gas additives, such as nitrogen (N) and oxygen (O), into these systems can be mentioned. As for among these especially a desirable thing, it is desirable to use what added the element of arbitration, such as Se, Pd, germanium, or In, for what uses a Sb-Te system as a principal component, and used this Sb-Te system as the principal component.

[0049] Moreover, in this invention, when phase change record film is used as record film, the phase change (phase transition) of between an amorphous (amorphous) condition and crystallized states can be reversibly carried out by the strength of a laser beam. And using optical change of the reflection factor by two changes of state of this amorphous state and crystallized state etc., record, playback, elimination, etc. can be performed or direct overwrite (over-writing) etc.

can be performed, without eliminating. Usually, after forming record film, it initializes by once crystallizing (format), and it is made to perform record/playback after that.

[0050] This invention For example, DVR (Digital Video Recording system) etc., Could apply to the optical disk which has a thin light transmission layer, and were constituted so that record and playback of an information signal might be performed using the semiconductor laser whose luminescence wavelength is about 650nm. It is possible to apply to optical disks constituted so that record and playback of an information signal might be performed using the so-called DVR-red and the semiconductor laser whose luminescence wavelength is about 400nm, such as the so-called DVR-blue. Using the objective lens which raised NA to 0.85 or more by combining two lenses with a serial preferably, this DVR is constituted possible [record of an information signal], and, specifically, has the storage capacity of about 22GB on one side. Moreover, although the optical disk with desirable application of these invention, such as this DVR, is suitably dedicated to the cartridge, application of this invention is not necessarily limited to what is dedicated to the cartridge.

[0051] When it constitutes the dielectric film formed on a disk substrate from two or more layers according to this invention constituted as mentioned above, the lower layer film can be covered from the film of this maximum upper layer with the film of the maximum upper layer of two or more of these layers.

[0052]

[Embodiment of the Invention] Hereafter, it explains, referring to a drawing about the operation gestalt of this invention. In addition, in the complete diagram of the following operation gestalten, the sign identically same into a corresponding part is attached.

[0053] Next, the optical record medium by 1 operation gestalt of this invention is explained. The optical disk by this 1 operation gestalt is shown in drawing 1 .

[0054] As shown in drawing 1 , in the optical disk 1 of the phase change mold by this 1 operation gestalt, the information signal layer 7 from which the laminating of the reflective film 3, the lower layer dielectric film 4, record film 5, and the upper dielectric film 6 was carried out one by one and which they consisted of is formed on the 1 principal plane of the disk substrate 2. Moreover, with the side in which the disk substrate 2 in the information signal layer 7 on the 1 principal plane of this disk substrate 2 exists, the light transmission layer 10 to which the laminating of a glue line 8 and the light transmission nature sheet 9 was carried out one by one is formed in the principal plane of the opposite side. The information signal layer 7 and the light transmission layer 10 are formed one by one on the 1 principal plane of the disk substrate 2 as mentioned above, and the optical disk 1 by this 1 operation gestalt is constituted. Moreover, in this optical disk 1, the laser beam L1 for record/playback is irradiated from the side in which the light transmission layer 10 was formed to the disk substrate 2. Moreover, this optical disk 1 is an optical disk with which an information signal is recorded on the both sides of the irregularity formed in that one principal plane and which adopted the so-called land groove recording method.

[0055] The disk substrate 2 consists of plastic material excellent in low cost-ization of for example, polycarbonate system resin, polyolefine system resin, acrylic resin, etc. When using a polycarbonate (PC) among these ingredients, that whose bending elastic modulus a coefficient of thermal expansion is about 2.4x104 about in 7.0x10 to five is used. Moreover, when using the polyolefine system resin (for example, ZEONEX (trademark)) of low absorptivity, such as a cycloolefin polymer, that whose bending elastic modulus a coefficient of thermal expansion is about 2.3x104 about in 6.0x10 to five is used. In addition, to the disk substrate 2, the optical disk 1 by this 1 operation gestalt is constituted so that record/playback of an information signal may be performed by irradiating the side in which the thin light transmission layer 10 was formed to a laser beam. Therefore, since it is not necessary to take into consideration whether it has permeability as a disk substrate 2, it is also possible to use the substrate which consists of metals, such as aluminum, for example. Moreover, production of this disk substrate 2 is performed by 2P law which used for example, an injection-molding method and ultraviolet-rays hardening resin. Moreover, the thickness of the disk substrate 2 is chosen from 0.3-1.3mm, and is chosen as 1.1mm in this 1 operation gestalt, for example. When this has the thickness of a disk substrate smaller than 0.3mm, it is because the reinforcement of optical disk 1 the very thing falls or it curvature-comes to be easy. On the other hand, when the thickness of an optical disk 1 will become large as compared with the thickness (about 1.2mm) of optical disks, such as CD and DVD, if the thickness of the disk substrate 2 is larger than 1.3mm, and commercialization of the driving gear corresponding to both CD, DVD, and the optical disk by this 1 operation gestalt is taken into consideration, it is because it may become impossible to share the same disk tray.

[0056] Moreover, the disk substrate 2 has the flat-surface circular ring configuration where the center hall (not shown) was formed in the center section. And the bore (path of a center hall) of the disk substrate 2 is 15mm, and an outer diameter is 120mm. In addition, the slot truck (not shown) of the irregularity which consists of a land and a groove is formed in one principal plane in which the information signal layer 7 of this disk substrate 2 is formed. The track pitch Tp in the slot truck of this irregularity is 0.3 micrometers. Moreover, in the configuration of a slot truck, it is possible to consider as various configurations, such as the shape of a spiral, concentric circular, and a pit train. And with guidance by such slot truck, an optical disk 1 is rotated and the location of arbitration constitutes the laser spot movable.

[0057] Moreover, the reflective film 3 consists of a metal or semimetal. And when the reflex function in the reflective film 3 is taken into consideration, while having reflective power to the wavelength of the laser beam used for record playback as an ingredient of the reflective film 3, it is desirable that thermal conductivity consists of the metallic element which has the value of 4.0x10-2 - 4.5x102 J/m-K-s (4.0x10-4 - 4.5 J/cm-K-s) within the limits, metalloid element and these compounds, or mixture. That is, specifically as an ingredient of the reflective film 3, the alloy which uses simple substances, such as aluminum, Ag, Au, nickel, Cr, Ti, Pd, Co, Si, Ta, W, Mo, and germanium, or these simple substances as a principal component can be mentioned. And when the field of practicality is taken into consideration, the ingredient of aluminum system of these, Ag system, Au system, Si system, or germanium system is desirable. Moreover, when using an alloy as an ingredient of the reflective film 3, AlCu, AlTi, AlCr, AlCo, AlMgSi, AgPdCu, AgPdTi, AgCuTi, AgPdCa, AgPdMg, AgPdFe, Ag or SiB, etc. is desirable. Furthermore, the ingredient of the reflective film 3 is set up in consideration of an optical property and a heat characteristic. That is, if the thickness of the reflective film 3 is generally set as the magnitude (for example, 50nm or more) which is extent which a laser beam L1 does not penetrate, while a reflection factor will become high, heat dissipation nature improves. Since especially the ingredient of aluminum system and the ingredient of Ag system have a high reflection factor when a laser beam -- the reflection factor becomes 80% or more to the exposure of the blue laser beam whose wavelength lambda is about 400nm -- is short wavelength, its alloy which used as the principal component the alloy which used aluminum as the principal component, or Ag is desirable. From the above thing, for example, Ag alloy is used as reflective film 3 in this 1 operation gestalt. Moreover, it is chosen [in / it is set up from a viewpoint which suppresses the effect which it has on mechanical properties, such as a skew, with the stress produced on the reflective film 3 while securing enough diffusion of the heat which produces the thickness of the reflective film 3 in record film 5, i.e., a heat cooling property, and keeping a jitter property good to the minimum, is specifically chosen out of 50-200nm, and / this 1 operation gestalt] as 120nm, for example.

[0058] Moreover, as for the lower layer dielectric film 4 and the upper dielectric film 6, it is desirable that consist of ingredients with low absorbing power, and the value of an extinction coefficient k specifically consists of 0.3 or less ingredients to the laser beam for record playback. In this 1 operation gestalt, ZnS-SiO2 (a mole ratio is about 4:1 especially) is used as a lower layer dielectric film 4, for example. Moreover, the thickness of this lower layer dielectric film 4 is 14nm.

[0059] Moreover, the upper dielectric film 6 consists of a cascade screen of ZnS-SiO2 film, the silicon nitride (SiN) film or ZnS-SiO2 film, and an SiN film. Moreover, the thickness of the upper dielectric film 6 is chosen as the range which corrosion produces neither in the reflective film 3 nor record film 5, and, specifically, is chosen as 10nm or more. Moreover, consideration of the tact time of manufacture etc. chooses the upper dielectric film 6 as about 140nm.

[0060] Moreover, when adopting the optical disk of a phase change mold as this optical disk 1, record film 5 consists of a phase change record ingredient, and becomes a SbTe system ingredient and a concrete target from SbTe in this 1 operation gestalt, for example. Moreover, the thickness of record film 5 is 12nm.

[0061] Moreover, the glue line 8 prepared on the information signal layer 7 consists of for example, a pressure-sensitive binder, ultraviolet-rays hardening resin, etc. And preferably, in order to prevent aging of the information signal layer 7, the periphery edge in radial [of a glue line 8] is prepared so that it may be from a periphery edge radial [in the information signal layer 7] on 0.5mm or more periphery side.

[0062] Moreover, as for the light transmission nature sheet 9 formed through the glue line 8 on the information signal layer 7, it is desirable that absorbing power consists of low ingredients to the laser beam used for record/playback, and it is more desirable for the permeability of a laser beam to consist of 90% or more of ingredients. Specifically, the light transmission nature sheet 9 consists of a sheet-like base material of the shape of a flat-surface circular ring which consisted of for example, a polycarbonate resin ingredient and polyolefine system resin. When the ingredient whose coefficient of thermal expansion is 7.0x10 to about five and whose bending elastic modulus is about 2.4x104 when using a polycarbonate (PC) is specifically used and it uses polyolefine system resin (for example, ZEONEX (trademark)), the ingredient whose coefficient of thermal expansion is 6.0x10 to about five and whose bending elastic modulus is about 2.3x104 is used. Moreover, the thickness of this light transmission nature sheet 9 is chosen from within the limits of 3-177 micrometers, and in this 1 operation gestalt, it is chosen so that the thickness of the sum total with a glue line 8 may be set to 100 micrometers. Moreover, high density record is realizable by combining such a thin light transmission layer and about 0.85 objective lens which turned high NA. In addition, the light transmission nature sheet 9 by this 1 operation gestalt feeds polycarbonate resin into an extruder, it carries out melting of this polycarbonate resin at the temperature of 250-300 degrees C using a heater (not shown), is fabricated in the shape of a sheet using two or more cooling rollers, and is formed by judging in the configuration doubled with the disk substrate 2.

[0063] Moreover, as the creation approach of the optical disk 1 constituted as mentioned above, it can roughly divide and the following two approaches can be used.

[0064] The 1st approach is the approach of carrying out the laminating of the multilayers and forming a smooth light transmission protective layer at the end on the support substrate with which the guide rail was formed. The approach of using ultraviolet-rays hardening resin as adhesives, and sticking the sheet (film) of optical sufficiently smooth light transmission nature which consists of polycarbonate system resin, polyolefine system resin, etc. with a thickness of 100 micrometers or less, for example by UV irradiation as the formation approach of a light transmission protective layer, or the approach of sticking through the pressure-sensitive binder which has an adhesive function can be used.

[0065] Moreover, the 2nd approach is the approach of carrying out the laminating of the multilayers and forming the smooth disk substrate 2 at the end on the light transmission protective layer in which the guide rail was formed. In addition, as an approach of forming a concavo-convex slot truck in a light transmission protective layer with a thickness of 100 micrometers or less, the approach of imprinting irregularity by the injection-molding method, 2P law or sticking by pressure, and pressurization etc. can be used.

[0066] Since the process which forms the process or multilayers which forms irregularity on a light transmission protective layer between the two above approaches is not necessarily easy, when mass-production nature is taken into consideration, it is desirable to use the 1st approach. Below, the manufacture approach of the optical disk 1 by the 1st approach of the two above-mentioned approaches is explained. First, the sputtering system used for membrane formation by this 1st approach is explained.

[0067] That is, the sputtering system used for manufacture of the optical disk 1 by this 1 operation gestalt is a quiescence opposed type sputtering system of single wafer processing in which substrate rotation is possible. First, here shows DC sputtering system of the quiescence opposed type by this 1 operation gestalt to drawing 2 . Moreover, the sputtering system of this quiescence opposed type is a sputtering system of single wafer processing which forms a thin film on one disk substrate 2 using one target.

[0068] In the sputtering system according to this 1 operation gestalt as shown in drawing 2 The sputtering cathode section 25 connected with the vacuum chamber 21 used as a membrane formation room, the vacuum control section 22 which controls the vacua in this vacuum chamber 21, the DC high voltage power supply 23 for plasma discharge, and this DC high voltage power supply 23 for plasma discharge through power-source Rhine 24, It has the sputtering gas feed zone 27 for supplying sputtering gas called inert gas and reactant gas, such as the pallet 26 by which opposite arrangement is carried out with this sputtering cathode section 25 and a predetermined distance, and Ar, in the vacuum chamber 21, and is constituted.

[0069] In the sputtering cathode section 25, it consists of magnet systems 30 prepared in the field of the opposite side with the target 28 which consists of the AlCu alloy which functions as the negative electrode, a SbTe alloy, and target ingredients, such as ZnS-SiO2, the back up plate 29 constituted so that this target 28 might be fixed, and the field which the target 28 of this back up plate 29 fixes. Moreover, the electrode of a pair consists of a pallet 26 which functions as a positive electrode, and a target 28 which functions as negative electrodes. On a pallet 26, it counters with the sputtering cathode section 25, and the disk substrate 2 which is the body formed membranes is attached across the disk base 33 with the inner circumference mask 31 and the periphery mask 32 in between. Here, the inner aperture of the periphery mask 32 is 119mm. Namely, as for the disk substrate 2 with a diameter of 120mm, even the inside is masked about 0.5mm from the periphery with the periphery mask 32.

[0070] Moreover, with the field in which the disk base 33 of a pallet 26 is attached, the field inboard of the disk substrate 2 is made to rotate a pallet 26 to the field of the opposite side, and it is prepared possible [linkage of the substrate rotation mechanical component 34 for making the disk substrate 2 rotate by this].

[0071] Moreover, in the sputtering system 20 by this 1 operation gestalt, as shown in drawing 3 C, the disk substrate 2 as the body which has the shape of a flat-surface circular ring as shown in drawing 3 A formed membranes, and the target 28 which consists of a membrane formation ingredient which has the shape of a disk type as shown in drawing 3 B are arranged in those superficial physical relationship, so that the core O of the disk substrate 2 and core O' of a target 28 may be mostly in agreement. Moreover, the disk substrate 2 is constituted by the substrate rotation mechanical component 34 shown in drawing 2 so that it can be made to rotate around the core O.

[0072] The sputtering system 20 used for manufacture of an optical disk [in / as mentioned above / this 1 operation gestalt] is constituted.

[0073] In case DC sputtering system shown in drawing 2 mentioned above is used, it exhausts by the vacuum control section 22 first until it will be to sputtering in a desirable predetermined vacua about the inside of the vacuum chamber 21.

[0074] Next, by the sputtering gas feed zone 27, in the vacuum chamber 21, sputtering gas, such as for example, Ar gas and N2 gas, is introduced until it becomes a predetermined pressure. Then, in this condition, predetermined negative potential is impressed to a target 28 by impressing predetermined negative potential to the back up plate 29 from the DC high voltage power supply 23 for plasma discharge. Electric field arise between the pallets 26 and the back up plate 29 which form the electrode of a pair by this, and glow discharge occurs. By this glow discharge, ionized Ar gas carries out sputtering of the target 28. A target ingredient will be in an atomic condition from a target 28 by this, and it will be begun to beat. This target ingredient begun to beat is deposited on disk substrate 2 front face attached in the pallet 26 which countered the target 28 and has been arranged. When predetermined carries out time amount continuation of this deposition, the thin film which consists of a desired ingredient is formed on the disk substrate 2.

[0075] In manufacture of the optical disk by this 1 operation gestalt In case sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, record film 5, and the upper dielectric film 6 that consists of a two-layer dielectric film is carried out on the disk substrate 2 DC sputtering chamber constituted as mentioned above in order to maintain those interfaces at clarification -- two or more sets and this 1 operation gestalt -- setting -- six-set of the 1- sequential membrane formation of the film which constitutes the information signal layer 7 is carried out using 6th DC sputtering chamber. In addition, in the following manufacture processes, the same sign is used also in the DC sputtering system 20 mentioned above about the sign of the sputtering chamber used for membrane formation of each class, respectively.

[0076] Now, in the manufacture approach of the optical disk by this 1 operation gestalt, the disk substrates 2, such as a PC board, are first carried in to the 1st sputtering system with which the target 28 which consists of AgM (M: additive) was installed in the vacuum chamber 21, and it fixes to a pallet 26. Next, Ag alloy is formed on the 1 principal plane of the disk substrate 2 by the sputtering method using for example, Ar gas as sputtering gas. Thereby, the reflective film 3 which consists of an Ag alloy is formed on the 1 principal plane of the disk substrate 2. Moreover, the reflective film 3 which consists of an Ag alloy is formed in parallel using the 2nd sputtering system with which same Ag alloy target was installed also in the 1st sputtering system on the 1 principal plane of other disk substrates 2.

[0077] Next, the disk substrate 2 with which the reflective film 3 was formed is carried in to the 2nd sputtering system with which the target 28 which consists of ZnS-SiO2 was installed, and it fixes to a pallet 26. Next, vacuum suction of the pressure in the vacuum chamber 21 is carried out to about 1.0x10 - 4Pa. Then, ZnS-SiO2 is formed on the reflective film 3 by performing sputtering, introducing inert gas, such as for example, Ar gas, in the vacuum chamber 21. Thereby, the lower layer dielectric film 4 which consists of ZnS-SiO2 is formed on the reflective film 3. Then, the disk substrate 2 with which the lower layer dielectric film 4 was formed is taken out from the vacuum chamber 21 in which the target 28 which consists of this ZnS-SiO2 was installed.

[0078] Next, the disk substrate 2 with which the reflective film 3 and the lower layer dielectric film 4 were formed is carried in in the vacuum chamber 21 in which the target 28 which consists of a SbTe alloy as a phase change record ingredient was installed, and it fixes to a pallet 26. Next, vacuum suction of the pressure in this vacuum chamber 21 is carried out to about 1.0x10 - 4Pa. Then, SbTe is formed on the lower layer dielectric film 4, introducing inert gas, such as for example, Ar gas, in the vacuum chamber 21. Thereby, the record film 5 which consists of a SbTe alloy is formed on the lower layer dielectric film 4. Then, the disk substrate 2 with which even the record film 5 with which the SbTe alloy target is installed was formed from the vacuum chamber 21 is taken out.

[0079] Then, the upper dielectric film 6 which consists of ZnS-SiO2 is formed by the sputtering method on the disk substrate 2 with which the laminating even of the record film 5 was carried out one by one from the reflective film 3. At this time, even if that thickness compares this upper dielectric film 6 with membrane formation of Ag alloy which it is not only very large, but constitutes the reflective film 3 as compared with the lower layer dielectric film 4 or record film 5, that membrane formation rate is small. Therefore, the time amount which forms the upper dielectric film 6 will become very long as compared with other film, and rate-limiting [of the formation of the information signal layer 7 on the disk substrate 2] will be carried out to the membrane formation time amount of the upper dielectric film 6 as a result. Then, as for the upper dielectric film 6, it is desirable to form membranes in at least 2 steps. As for the thickness of the film which forms membranes in each sputtering system, at this time, it is desirable to set up so that it may become mutual almost equal. In addition, these are optimized and it is made for the membrane formation time amount of two or more film which constitutes the upper dielectric film 6 to become close to the membrane formation time amount of other film in the information signal layer 7 according to the thickness considered as the request of the upper dielectric film 6, and the membrane formation rate of the ingredient. Thereby, time amount which formation of the information signal layer 7 takes can be made into the minimum.

[0080] That is, the disk substrate 2 with which the laminating of the reflective film 3, the lower layer dielectric film 4, and the record film 5 was carried out one by one is first carried in in the vacuum chamber 21 in which the target 28 which consists of ZnS-SiO2 was installed, and it fixes to a pallet 26. Next, vacuum suction of the pressure in this vacuum chamber 21 is carried out to about 1.0x10 - 4Pa. Then, ZnS-SiO2 is formed on record film 5 by performing sputtering, introducing inert gas, such as for example, Ar gas, in the vacuum chamber 21.

Thereby, 1st upper dielectric film 6a which consists of ZnS-SiO2 is formed on record film 5. At this time, 1st upper dielectric film 6a forms membranes to almost middle thickness to the thickness of the upper dielectric film 6 considered as a request. Then, 1st upper dielectric film 6a takes out the disk substrate 2 by which the laminating was carried out one by one from the vacuum chamber 21 to on 1 principal plane from the reflective film 3.

[0081] Then, the disk substrate 2 with which the laminating of the reflective film 3, the lower layer dielectric film 4, record film 5, and the upper dielectric film 6of ** 1st a was carried out one by one is carried in in the vacuum chamber 21 in which the target 28 which consists of ZnS-SiO2 was installed, and it fixes to a pallet 26. Next, vacuum suction of the pressure in this vacuum chamber 21 is carried out to about 1.0x10 - 4Pa. Then, ZnS-SiO2 is formed on 1st upper dielectric film 6a by performing sputtering, introducing inert gas, such as for example, Ar gas, in the vacuum chamber 21. 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed on 1st upper dielectric film 6a by this, and the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed. Then, the disk substrate 2 with which the laminating of the upper dielectric film 6 was carried out one by one from the reflective film 3 on the 1 principal plane is taken out from the vacuum chamber 21.

[0082] Of the above, the information signal layer 7 is formed on the 1 principal plane of the disk substrate 2.

[0083] Then, the sheet on which the glue line 8 which becomes the whole surface of the light transmission nature sheet 9 which consists of a light transmission nature sheet of a flat-surface circular ring configuration from a pressure-sensitive binder (PSA) was put is stuck on one principal plane in which the information signal layer 7 of the disk substrate 2 was formed in the field of a glue line 8 using the predetermined lamination equipment with which prevention of blocking high and cellular mixing was achieved, for example. Thereby, as the information signal layer 7 of the disk substrate 2 is covered, the light transmission layer 10 is formed.

[0084] The optical disk 1 shown in drawing 1 is manufactured by the above.

[0085] Then, two optical disks 1 manufactured as mentioned above are prepared if needed. And as those disk substrates 2 side becomes inside, it sticks using predetermined adhesives. Thereby, a double-sided record mold optical disk is manufactured. Thus, when preparing two optical disks 1 and sticking them, thickness of the disk substrate 2 is set to about 0.5mm, and it is made for the thickness of the disk substrate 2 to be set to about 1.0mm in the condition of sticking two sheets.

[0086] Here, this invention person experimented about the effect fluctuation of the thickness of the upper dielectric film 6 mentioned above affects an optical disk. That is, 14nm and thickness of record film 5 are set [the thickness of the reflective film 3 on the 1 principal plane of the disk substrate 2] to 12nm for the thickness of 120nm and the lower layer dielectric film 4, and the reflection factor of the properties of the optical disk at the time of making the thickness of the upper dielectric film 6 fluctuate **3% from 140nm, a jitter, a modulation factor (modulation), and the measurement result of RISORYUSHON are shown in Table 1. In addition, the record luminescence pattern used for this evaluation result is shown in drawing 4 .

[0087]

[Table 1]

	厚さ	反射率	ジッター	モジュレーション	リソリューション
+3%	144.2mm	0.177	10.455	0.498	0.225
	140.0mm	0.190	10.319	0.472	0.227
-3%	135.8mm	0.216	9.932	0.441	0.248

[0088] When it decreases 6.8% when thickness is made to increase by 3% and it is referred to as 144.2nm about a reflection factor from Table 1, and thickness is decreased 3% and it is referred to as 135.8nm, it turns out that it increases no less than 13.7%. Moreover, it turns out that it increases 1.3% about a jitter when thickness is made to increase by 3%, and it decreases 3.8% when decreasing thickness 3%. Moreover, it turns out that it increases 5.0% about modulation when thickness is made to increase by 3%, and it decreases 6.6% when decreasing thickness 3%. Moreover, when decreasing 0.9% about RISORYUSHON when thickness is made to increase by 3%, and decreasing thickness 3%, it turns out that it increases 9.3%.

[0089] Thus, by fluctuating the thickness of the upper dielectric film 6 about **3% shows changing 10% or more about a reflection factor. That is, thickness fluctuation of this upper dielectric film 6 shows having big effect on the property of optical disks, such as a reflection factor, a jitter, a modulation factor (modulation), and RISORYUSHON. Therefore, it will be necessary to suppress thickness fluctuation of the upper dielectric film 6 in the same optical disk to the minimum.

[0090] Next, the 1st example of a comparison for comparing the effectiveness by the 1st based on 1 above-mentioned operation gestalt to 5th example and this 1 operation gestalt and the 2nd example of a comparison are explained.

[0091] In the 1st example of the 1st ********, as a sputtering system, if shown in drawing 2 , the sputtering system 20 using the same inner circumference mask 31 and the same periphery mask 32 will be used. Moreover, the inner aperture of the periphery mask 32 is 119mm. Moreover, as shown in drawing 3 C, as core O' of the circle of the target 28 which shows the disk substrate 2 and a target 28 to the circular ring core O of the disk substrate 2 shown in drawing 3 A and drawing

3 B laps, it is arranged in this sputtering system 20.

[0092] Moreover, as a sputtering system which forms each film of the information signal layer 7, six vacuum chambers 21 are formed on the disk substrate 2, and it is constituted. That is, the target 28 which becomes the 1st vacuum chamber 21 and the 2nd vacuum chamber 21 from the AgPdCu alloy for forming the reflective film 3 is formed. Moreover, the target 28 which becomes the 3rd vacuum chamber 21 from ZnS-SiO2 for forming the lower layer dielectric film 4 is formed. Moreover, the target 28 which becomes the 4th vacuum chamber 21 from SbTe for forming record film 5 is formed. Moreover, the target which becomes the 5th vacuum chamber 21 and the 6th vacuum chamber 21 from ZnS-SiO2 for forming 1st upper dielectric film 6a and 2nd upper dielectric film 6b, respectively is prepared.

[0093] And sequential membrane formation of the reflective film 3 whose thickness is 120nm, the lower layer dielectric film 4 whose thickness is 14nm, and the record film 5 whose thickness is 12nm is first carried out on the disk substrate 2, performing masking using the inner circumference mask 31 and the periphery mask 32 using the 1st to 4th vacuum chamber 21. Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 1st example is 70nm. Next, after taking out the disk substrate 2 from the 5th vacuum chamber 21, the periphery mask 32 is removed.

[0094] The disk substrate 2 by which the periphery mask 32 was removed is continuously carried in in the 6th vacuum chamber 21 in which ZnS-SiO2 target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering is performed and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 1st example is 70nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed.

[0095] The laminating of the reflective film 3, the lower layer dielectric film 4, record film 5, and the upper dielectric film 6 is carried out on the disk substrate 2 as mentioned above, and the information signal layer 7 is formed. Then, in 1 operation gestalt mentioned above, the optical disk 1 according the sheet with a thickness of 100 micrometers with which the glue line 8 was put on 1 principal-plane 2a of the disk substrate 2 and the light transmission nature sheet 9 using lamination equipment to lamination and the 1st example is manufactured similarly.

[0096] In the 2nd example of the 2nd ********, thickness carries out sequential membrane formation of the same reflective film 3, the lower layer dielectric film 4, and the record film 5 also in the 1st example using the same sputtering system 20 also in the 1st example, respectively.

[0097] Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 2nd example is 30nm. Next, after taking out the disk substrate 2 from the 5th vacuum chamber 21, the periphery mask 32 is removed.

[0098] The disk substrate 2 by which the periphery mask 32 was removed is continuously carried in in the 6th vacuum chamber 21 in which ZnS-SiO2 target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering using predetermined gas, such as Ar gas, is performed, and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 2nd example is 110nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed. Then, in the 1st example, the light transmission layer 10 is formed and the optical disk 1 by the 2nd example is manufactured similarly.

[0099] In the 3rd example of the 3rd ********, sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is similarly carried out on the disk substrate 2 in the 1st example.

[0100] Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 3rd example is 10nm. Next, after taking out the disk substrate 2 from the 5th vacuum chamber 21, the periphery mask 32 is removed.

[0101] The disk substrate 2 by which the periphery mask 32 was removed is continuously carried in in the 6th vacuum chamber 21 in which ZnS-SiO2 target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering is performed and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 3rd example is 130nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed. Then, in the 1st example, the light transmission layer 10 is formed and the optical disk 1 by the 3rd example is manufactured similarly.

[0102] In the 4th example of the 4th ********, sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is similarly carried out on the disk substrate 2 in the 1st example.

[0103] Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 4th example is 5nm. Then, after taking out the disk substrate 2 from the 5th vacuum chamber 21, the periphery mask 32 is removed.

[0104] The disk substrate 2 by which the periphery mask 32 was removed is continuously carried in in the 6th vacuum chamber 21 in which ZnS-SiO2 target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering is performed and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 4th example is 135nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed. Then, in the 1st example, the light transmission layer

10 is formed and the optical disk 1 by the 4th example is manufactured similarly.

[0105] In the 5th example of the 5th ********, sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is similarly carried out on the disk substrate 2 in the 1st example.

[0106] Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 5th example is 30nm.

[0107] Next, after taking out the disk substrate 2 from the 5th vacuum chamber 21, while removing the periphery mask 32, the target 28 in the 5th vacuum chamber 21 is exchanged for Si target. Then, the disk substrate 2 is carried in in the 5th vacuum chamber 21, and it fixes to a pallet 26.

[0108] The disk substrate 2 by which the periphery mask 32 was removed is continuously carried in in the 5th vacuum chamber 21 in which Si target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, SiN is formed on 1st upper dielectric film 6a by performing sputtering using N2 gas. Thereby, the 1st SiN film is formed on 1st upper dielectric film 6a. The thickness of this SiN film is 15nm. Then, the disk substrate 2 is taken out from the 5th vacuum chamber 21.

[0109] Next, the disk substrate 2 with which the 1st SiN film was formed on 1st upper dielectric film 6a is carried in in the 6th vacuum chamber 21 in which Si target was installed as a target 28, and it fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, SiN is formed on the 1st SiN film by performing sputtering using N2 gas. Thereby, the 2nd SiN film is formed on the 1st SiN film. Here, the thickness of this 2nd SiN film is 15nm. And 2nd upper dielectric film 6b which consists of a cascade screen of these 1st SiN film and the 2nd SiN film and whose thickness is 30nm is formed. In addition, this 2nd upper dielectric film 6b is formed from a two-layer SiN film, because the membrane formation rate of SiN is very slow. Therefore, since 2nd upper dielectric film 6b is formed by forming SiN twice, the manufacture tact time of an optical disk 1 can be shortened.

[0110] Then, in the 1st example, the light transmission layer 10 is formed and the optical disk 1 by the 5th example is manufactured similarly.

[0111] In the 1st example of a comparison of the 1st example ** of a comparison, the upper dielectric film 6 in an optical disk 1 consists of ZnS-SiO2 two-layer film similarly in an example. Moreover, as a sputtering system which forms each film of the information signal layer 7, six vacuum chambers 21 are formed on the disk substrate 2, and it is constituted. That is, the target 28 which becomes the 1st vacuum chamber 21 and the 2nd vacuum chamber 21 from the AgPdCu alloy for forming the reflective film 3 is formed. Moreover, the target 28 which becomes the 3rd vacuum chamber 21 from ZnS-SiO2 for forming the lower layer dielectric film 4 is formed. Moreover, the target 28 which becomes the 4th vacuum chamber 21 from SbTe for forming record film 5 is formed. Moreover, the target which becomes the 5th vacuum chamber 21 and the 6th vacuum chamber 21 from ZnS-SiO2 for forming 1st upper dielectric film 6a and 2nd upper dielectric film 6b, respectively is prepared.

[0112] In this 1st example of a comparison, sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is similarly carried out in the 1st example.

[0113] Then, in the 5th vacuum chamber 21, ZnS-SiO2 is formed on record film 5, making the disk substrate 2 rotate around the medial axis performing masking using the inner circumference mask 31 and the periphery mask 32. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of 1st upper dielectric film 6a in this 1st example of a comparison is 70nm. Then, the disk substrate 2 is taken out from the 5th vacuum chamber 21.

[0114] It carries in continuously in the 6th vacuum chamber 21 in which ZnS-SiO2 target was installed as a target 28, and fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering is performed and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 1st example of a comparison is 70nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed.

[0115] Then, in the 1st example, the light transmission layer 10 is formed and the optical disk 1 by the 1st example of a comparison is manufactured similarly.

[0116] In the 2nd example of a comparison of the 2nd example ** of a comparison, sequential membrane formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is similarly carried out on the disk substrate 2 in the 1st example of a comparison. In addition, in this 2nd example of a comparison, sequential formation of the reflective film 3, the lower layer dielectric film 4, and the record film 5 is carried out, without differing also in the 1st example of a comparison and using the periphery mask 32.

[0117] ZnS-SiO2 is formed on record film 5, making the disk substrate 2 the disk substrate 2 rotate around the medial axis in the 5th vacuum chamber 21 only using the inner circumference mask 31, after even record film 5 forms membranes. Of this, 1st upper dielectric film 6a is formed on record film 5. Here, the thickness of this 1st upper dielectric film 6a is 70nm. Then, the disk substrate 2 is taken out from the 5th vacuum chamber 21.

[0118] It carries in continuously in the 6th vacuum chamber 21 in which

ZnS-SiO2 target was installed as a target 28, and fixes to a pallet 26. Then, while making the disk substrate 2 rotate around the core, sputtering is performed and ZnS-SiO2 is formed on 1st upper dielectric film 6a. Thereby, 2nd upper dielectric film 6b which consists of ZnS-SiO2 is formed. Here, the thickness of 2nd upper dielectric film 6b in this 2nd example of a comparison is 70nm. Of the above, the upper dielectric film 6 which consists of the 1st upper dielectric film 6a and the 2nd upper dielectric film 6b is formed.

[0119] Then, in the 1st example, the light transmission layer 10 is formed and the optical disk 1 by the 2nd example of a comparison is manufactured similarly.

[0120] And the distance dependency from a mask edge of the reflection factor in the record section periphery section of those optical disks 1 was compared to the optical disk manufactured by the manufacture approach by the 1st to 5th example as mentioned above, and the optical disk manufactured by the manufacture approach by the 1st example of a comparison, and the 2nd example of a comparison. The comparison result is shown in drawing 5 . In addition, the record luminescence pattern in measurement of this reflection factor is a wave shown in drawing 4 , and, in the wavelength of a laser beam, 405nm and record bit length set NA of 0.13micrometers [bit] /and an objective lens to 0.85.

[0121] Drawing 5 shows that reduction of the reflection factor in the optical disk by the 1st example of a comparison and the 2nd example of a comparison becomes large sharply as compared with the optical disk by the 5th example from the 1st example in the periphery section of the near field by the side of the inner circumference of the mask edge in an optical disk, i.e., a record section.

[0122] That is, in the 1st example of a comparison, it is a 1.1mm part from a mask edge, and it turns out that the reflection factor is 17% or less, and in the 2nd example of a comparison, it is a 0.8mm part from a mask edge, and it turns out that the reflection factor is 17% or less. And in the 1st example of a comparison, and the 2nd example of a comparison, a mask edge shows that it is the field which cannot be used as a record section in the band-like shape of a 0.8mm circular ring from a 0.8mm part, i.e., a mask edge. As compared with these 1st example of a comparison, and the 2nd example of a comparison, it turns out in the 1st example that a reflection factor is 17% or more also [near the mask edge (0mm part)]. Moreover, also in the 2nd to 5th example, it turns out that the distance from a mask edge can secure reflection factor sufficient in a part 0.4mm or more.

[0123] Therefore, it turns out that the reflection factor can be mostly equalized on the whole surface of the optical disk by the 5th example from the 1st example, and the optical disk excellent in the signal property can be obtained. In the phase in which the periphery mask 32 was attached especially, when membranes are formed to thickness 30nm or less, the reflection factor fall field is controlled by abbreviation one half as compared with the reflection factor fall field in the example of a comparison which used the periphery mask for all membrane formation. And the record section in the periphery section of an optical disk 1 is expanded by controlling a reflection factor fall field about 0.5mm in this way by the band-like range of the width of face which is about 0.5mm. In addition, a track pitch becomes possible [aiming at the increment in capacity of about 0.5GB (512MB) extent by expansion of the band-like range of about 0.5mm width of face] in the optical disk with which 0.3 micrometers and record bit length adopted the land groove recording method by which the wavelength of 0.13micrometers [bit] /and a laser beam set NA of 405nm and an objective lens to 0.85.

[0124] Moreover, temperature performed the high-humidity/temperature trial whose humidity is 85% at 80 degrees for 400 hours about the optical disk according [this invention person] to the 1st and 2nd examples of a comparison, and the optical disk by the 1st - the 5th example. Consequently, it was checked that corrosion does not arise from the 1st example in the periphery section of the optical disk by the 5th example. Moreover, also in the optical disk by the 1st example of a comparison, although it was checked that corrosion does not arise in the periphery section, especially in the optical disk by the 2nd example of a comparison, generating of corrosion was looked at by the periphery section in record film or the reflective film. Therefore, in the optical disk by this 1 operation gestalt, it turns out that it becomes possible to control generating of corrosion.

[0125] As explained above, according to this 1 operation gestalt, the upper dielectric film 6 in an optical disk 1 Controlling the corrosion of the reflective film 3 or record film 5, in case membranes are formed using at least two sets of the 5th vacuum chambers 21, and the 6th vacuum chamber 21 one by one The thickness distribution in alignment with radial [of the disk substrate 2 in the upper dielectric film 6 which constitutes an optical disk 1] It can be made homogeneity especially in the periphery section, and the fluctuation of the reflection factor in an optical disk 1 depending on thickness distribution of the upper dielectric film 6 in alignment with radial [of an optical disk 1] can be controlled. While being able to prevent thickness reduction of a dielectric film [/ near the mask edge], expanding a record section further and making it increase sharply [the storage capacity of an optical record medium] by this in case the laminating of the dielectric film which consists of two or more film on a disk substrate is carried out, controlling generating of the corrosion of the reflective film or record film, properties, such as a recording characteristic, can be raised. Therefore, it has the light transmission layer which consists of thin film, and the optical disk which has the good signal property formed into high recording density that record/playback of an information signal are performed by irradiating a laser beam, from the side in which this light transmission layer was prepared to the disk substrate can be obtained.

[0126] As mentioned above, although 1 operation gestalt of this invention was explained concretely, this invention is not limited to 1 above-mentioned operation gestalt, and various kinds of deformation based on the technical thought of this invention is possible for it.

[0127] For example, it is also possible not to pass over the membrane formation approach of each film and the ingredient of a disk substrate or a protective layer which were mentioned in 1 above-mentioned operation gestalt for an example to the last, but to use the membrane formation approach from this that it is different if needed, and to constitute a disk substrate and a protective layer from ingredients other than these.

[0128] Moreover, for example in 1 above-mentioned operation gestalt, although he is trying to show those superficial physical relationship in drawing 3 using the quiescence opposed type single-wafer-processing sputtering system which one target was made to counter to one disk substrate as a DC sputtering system This invention is not necessarily what is limited to a quiescence opposed type single-wafer-processing sputtering system. As shown in drawing 6 A, while fixing two or more disk substrates (the inside of drawing 6 A, eight sheets) 2 to a pallet

26 It is also possible to apply to the sputtering system which fixed two or more targets 28 to the vacuum chamber 21 as shown in drawing 6 B, and was made to form membranes to two or more disk substrates 2, rotating a pallet 26 in the direction of arrow-head b by the physical relationship shown in drawing 6 C.

[0129] For example, as shown in drawing 7 as an information signal layer 7 in 1 above-mentioned operation gestalt, it is also possible to constitute the reflective film 41 constituted so that the concentration of an additive might change in accordance with radial [of a disk substrate], the lower layer dielectric film 42 which consists of SiN or ZnS-SiO2, the 1st record film 43, the 2nd record film 44, and the upper dielectric film 45 that consists of a dielectric from a thing which carried out the laminating one by one, or a thing which carried out the laminating to the reverse order. Here, as for the 1st record film 43 and 2nd record film 44, that from which an ingredient, a presentation, or complex index of refraction differs is chosen. In addition, it is also possible to constitute this record film from a layer from which the ingredient of three or more layers, a presentation, or complex index of refraction differs mutually.

[0130] Moreover, it is also possible to use what kind of ingredient, for example, if it is the ingredient which does not have absorbing power to the wavelength of the laser beam used for record/playback although ZnS-SiO2 was used as dielectric materials in 1 above-mentioned operation gestalt, and, specifically, it is desirable for an extinction coefficient k to use 0.3 or less ingredient. It is possible to more specifically use the ingredient which consists of the nitride, the oxide, the carbide, a fluoride, a sulfide, a nitric oxide, ********, or acid carbide of elements, such as a metal and semimetal, such as aluminum, Si, Ta, Ti, Zr, Nb, Mg, B, Zn, Pb, calcium, La, and germanium, etc., and the ingredient which makes these a principal component as an ingredient of a dielectric film. More specifically moreover, as an ingredient of the lower layer dielectric film 4 and the upper dielectric film 6 AlN_x ($0.5 \le x \le 1$, especially AlN), aluminum 2O3-x ($0 \le x \le 1$ (especially)) aluminum 2O3, Si3N 4-x ($0 \le x \le 1$ (especially Si_3N_4)), SiO_x ($1 \le x \le 2$ (especially SiO_2, SiO), MgO, Y_2O_3, MgAl 2O4, TiO_x ($1 \le x \le 2$ (especially))) TiO_2, $BaTiO_3$, $SrTiO_3$, Ta 2O5-x ($0 \le x \le 1$ (especially)) Ta 2O5, GeO_x ($1 \le x \le 2$), SiC, ZnS, PbS, It is also possible to use germanium-N, germanium-N-O, Si-N-O, CaF_2, LaF, MgF_2, NaF, TiF_4, etc., and it is also possible to use further the mixture 2 of the ingredients which use these ingredients as a principal component, and these ingredients, for example, AlN-SiO.

[0131] For example, in 1 above-mentioned operation gestalt, although the disk substrate 2 is produced by the injection-molding method or the photopolymer method (2P law), even if it is except these two approaches, a desired configuration, i.e., thickness, is possible also for using what kind of approach, if

1.1mm and a diameter are the disk configuration which is about 120mm, and a method of obtaining the smooth nature on sufficient front face of a substrate optically.

[0132] Moreover, it is also possible for it not to be limited to any ingredients other than a phase change ingredient, and to use the magneto-optic-recording ingredient of a terbium and an iron (TbFe) system, a TbFeCo system, a GdFe system, and a GdFeCo system, for example, although the phase change ingredient which consists of a SbTe system ingredient as an ingredient of record film in 1 above-mentioned operation gestalt is used. Moreover, it is also possible to apply this invention to the mold disk only for playbacks (ROM) using aluminum alloy and Ag alloy as reflective film and the optical disk using the layer which consists of organic coloring matter as record film.

[0133] Moreover, it is also possible to constitute from a two-layer ingredient [at least] layer which consists of a metal or semimetal instead of the reflective film which consists of one layer although what consists of one layer of an AgPdCu alloy layer as reflective film 3 in 1 above-mentioned operation gestalt is used, for example. Thus, while becoming easy to carry out an optical design by constituting the reflective film from two or more ingredient layers, it becomes easy to balance a heat characteristic.

[0134] Moreover, in 1 above-mentioned operation gestalt, although he is trying to apply the sputtering system as membrane formation equipment by this invention to formation of the upper dielectric film which constitutes the information signal layer of an optical disk, this membrane formation equipment is possible also for using for formation of dielectric films in a semiconductor device, such as an SiN film and SiO2 film, or an insulator layer, and can be used for formation of other dielectric films or an insulator layer.

[0135] Moreover, in 1 above-mentioned operation gestalt, a disk substrate is taken out from a vacuum chamber, and when the periphery mask 32 can be removed without removing within a vacuum chamber being also possible and carrying out vacuum disconnection in this way although he is trying to remove the periphery mask 32 after carrying out vacuum disconnection, the upper dielectric film 6 can be formed, maintaining a membrane formation side at a pure condition.

[0136]

[Effect of the Invention] As explained above, according to the manufacturing installation of the optical record medium by this invention, and the manufacture approach of an optical record medium Thickness reduction of a dielectric film [/ near the mask edge] can be prevented controlling generating of the corrosion of the reflective film or record film, in case the laminating of the dielectric film which consists of two or more film on a disk substrate is carried out. By this While controlling reduction in a reflection factor, expanding a record section and making it increase sharply [the storage capacity of an optical record medium], properties, such as a recording characteristic, can be raised.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the optical disk by 1 operation gestalt of this invention.

[Drawing 2] It is the approximate line Fig. showing DC sputtering system used for membrane formation of each class which constitutes the information signal layer by 1 operation gestalt of this invention.

[Drawing 3] It is the top view showing the disk substrate by 1 operation gestalt of this invention, targets, and such superficial physical relationship.

[Drawing 4] In the optical disk by 1 operation gestalt of this invention, it is the graph which shows the record luminescence pattern used in case the reflection factor, the jitter property, the modulation, and RISORYUSHON at the time of changing the thickness of the upper dielectric film are evaluated.

[Drawing 5] It is the shown graph in the example of a comparison for comparing with the example based on 1 operation gestalt of this invention.

[Drawing 6] It is the top view showing other examples in the sputtering system by 1 operation gestalt of this invention.

[Drawing 7] It is the sectional view showing other examples of the information signal layer by this invention.

[Drawing 8] It is the sectional view showing the optical disk in front of the lamination which constitutes conventional DVD-RW.

[Drawing 9] It is the sectional view showing double-sided record mold DVD-RW and one side record mold DVD-RW by the conventional technique.

[Drawing 10] It is the sectional view showing the optical disk which has a thin light transmission layer, irradiates a laser beam from the side in which the light transmission layer was prepared, and performs record/playback of an information signal, and which was formed into high recording density.

[Drawing 11] It is the sectional view showing the disk substrate and information signal layer of an optical disk which have the upper dielectric film which consisted of two-layer dielectric films.

[Drawing 12] It is the sectional view showing the disk substrate and information signal layer of an optical disk which have the upper dielectric film which consisted of dielectric films of three layers.

[Description of Notations]

1 ... an optical disk and 2 ... a disk substrate and 2a ... one principal plane and 3 ... the reflective film and 4 ... a lower layer dielectric film and 5 ... record film and 6 ... the upper dielectric film and 6a ... the 1st upper dielectric film and 6b ... the 2nd upper dielectric film and 7 ... an information signal layer and 8 ... a glue line and 9 -- ... -- a light transmission nature sheet and 10 -- ... -- a light transmission layer and 20 -- ... -- a sputtering system and 21 -- ... -- a vacuum chamber and 31 -- ... an inner circumference mask and 32 -- ... a periphery mask